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QUEBEC METAL POWDERS LIMITED

Tracy, Quebec, Canada

INAUGURATION

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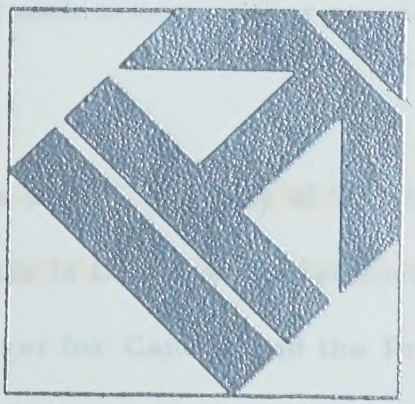

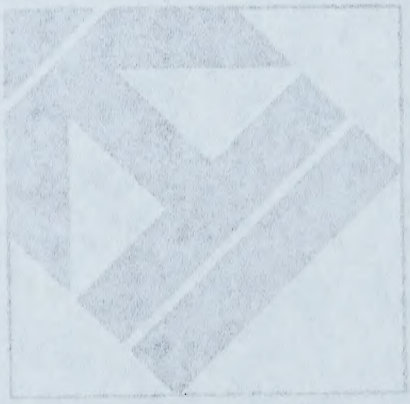

PRESS RELEASE (Wed. - 6.00 pm - Oct. 30, 1968)

QUEBEC METAL POWDERS LIMITED

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Tracy, Quebec ----- Mr. Lindsay F. Johnson Chairman of the Board announced that construction of the Quebec Metal Powders Limited facilities here has been completed. The Inauguration Ceremony was held on October 30, 1968, marking the commencement of commercial operations.

Construction of the plant began in October 1967 and was completed 385 days later. Nearly 400 construction workers were employed during the building program.

The plant has an annual capacity of 70,000 tons of iron powder and will employ 150 persons. This is the largest high compressibility iron powder plant in the world, another first for Canada and the Province of Quebec. The investment of the Company in this enterprise is approximately $10,000,000. The manufacturing facilities, offices, laboratories and warehouse occupy approximately 55,000 square feet. The plant is a modern, well equipped facility providing for the control of safety, air and water pollution.

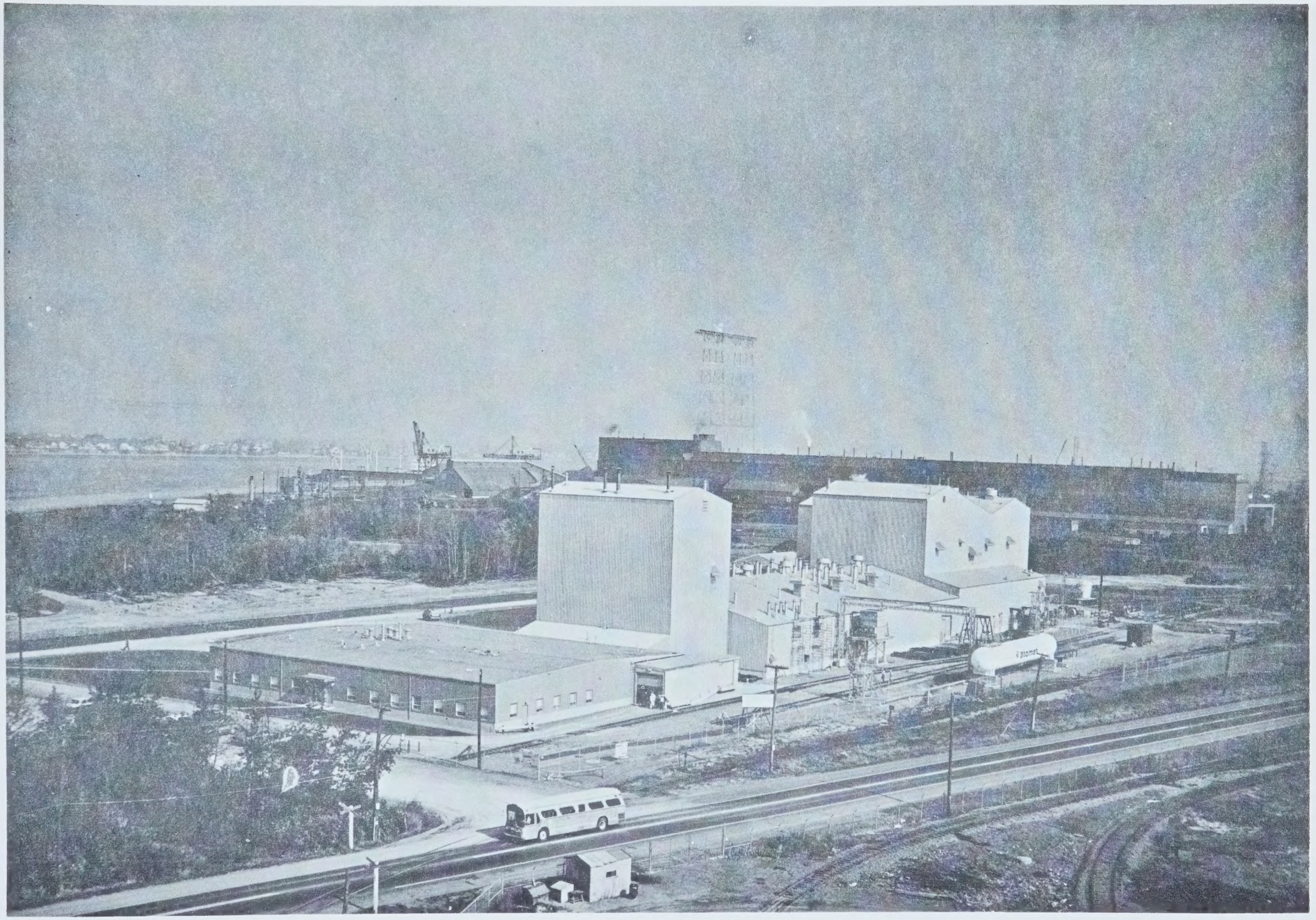
Under a proprietary and unique production process, molten iron produced from ilmenite ore mined at Havre St. Pierre, Quebec, is converted

into iron powder. This raw material is ideal for powdered iron production because of its purity, consistent quality and abundant supply. This is a further step in the processing of Quebec ore within the Province.

Iron powder is used principally in the fabrication of metal parts, in the manufacture of welding electrodes, and for flame cutting and scarfing. The use of iron powder has doubled over the last five or six years. Further rapid growth is anticipated with the availability of new metal powders and the development of new fabrication techniques.

Quebec Metal Powders serves the iron powder consuming industries with its products under the trademark ATOMET. The company's high compressibility iron powder, ATOMET 28, is particularly suited to the more complex and critical powder metallurgy applications.

The production of Quebec Metal Powders will add approximately $15,000,000 annually to Canada's export trade. The availability of these iron powder products in Quebec provides a basis for the establishment of related industries.



QUEBEC METAL POWDERS LIMITED

IRON POWDER FACILITY

The plant of 70,000 ton annual capacity is now commencing commercial operations.

ABOUT QUEBEC METAL POWDERS LIMITED

Incorporated in 1967

Quebec Metal Powders Limited was incorporated in 1967 under the laws of the Province of Quebec for the production of iron and iron base powder metal products. The investment of the Company in this enterprise is approximately $10,000,000. The plant has a production capacity of 70,000 tons of iron powder per year and will employ approximately 150 persons.

Construction

Construction of the plant began in October 1967 and was completed 385 days later. The construction contractor was Canadian Bechtel Limited. Nearly 400 construction workers were employed during the building program. The manufacturing facilities, offices, laboratories, and warehouse occupy approximately 55,000 square feet. The plant is a modern, well equipped and automated facility providing for safety, air and water pollution control.

From Quebec Ore

Quebec Metal Powders Limited is the first iron powder producer in the world to employ hot metal direct from ore for the manufacture of iron powder products. The molten iron used is produced from ilmenite ore mined at Havre St. Pierre, Quebec, 550 miles down the St. Lawrence from Tracy.

Production Process

Under a proprietary and unique production process, molten iron from

QUEBEC METAL POWDERS LIMITED

Annealing furnaces for the treatment of iron powder in the Quebec Metal Powders plant.

the Smelter of Quebec Iron and Titanium is converted into iron powder. The molten iron is initially transferred into a furnace and superheated. When the metal reaches the proper temperature, it is atomized, that is, broken down into fine solid particles by impact of high pressure water.

Powder particles of proper size and shape are then treated at high temperature in a controlled atmosphere furnace in order to remove final traces of carbon and oxygen. During this furnace treatment, the particles agglomerate or sinter to some extent. The sinter cake is then broken by a series of attrition mills.

Following final quality control approval, the powder is blended and packaged for shipment.

Quality Control

Iron powder for the production of P/M parts is accurately controlled in order to obtain the desired final part properties. Powders are characterized by their chemical analysis, micro structure, impurity content, particle size, particle size distribution, particle shape and surface area, flow rate, apparent density and sintering properties. The Quebec Metal Powder Laboratories are well equipped for control of product quality. There are facilities for complete chemical, physical and metallurgical testing. Process control has been automated in order to insure products of uniform quality.

Research & Development

Besides the manufacturing facilities, the building houses research

and development laboratories. The type of vigorous reserach which led to the unique production process will continue, developing products and process to meet the needs of the consumer.

CORPORATE SYMBOL

Symbols are as old as history. The Logo of Quebec Metal Powders is a modern adaptation of an early symbol for iron. The Chaldeans began the practice of associating seven symbols with seven planets, seven days of the week, and seven metals. Iron and the planet Mars were represented by a shield and a spear.

As writing became more prevelant, the use of hieroglyphics died out and in the Middle Ages the alchemists employed these forgotten symbols and others which they invented, as a secret "professional" language.

Quebec Metal Powders has adapted the symbol of the shield and spear to indentify the Company and its iron and iron base powder metal products.

QUEBEC METAL POWDERS LIMITED

Examples of parts made by the powder metallurgy process. Powder Metallurgy is ideally suited for the production of unusual or complex parts.

USES OF IRON POWDER

Approximately 65% of the iron powder marketed in North America is used in the fabrication of structural parts by powder metallurgy.

Welding electrodes consume approximately 25% of the output and flame cutting and scarfing applications represent another 5% of production.

Powder Metallurgy

Powder metallurgy is the technique of fabricating solid articles from metal powder. By the powder metallurgy process, strong, complex parts may be produced to close tolerances in large quantities with a minimum of machining and at attractive unit costs. Structural parts produced by the powder metallurgy process are used in automobiles, appliances, farm and garden equipment, cameras, business machines and similar equipment. These industries are widening their application of powder metallurgy because of attractive cost savings.

Welding Electrodes

Welding electrodes are often coated with iron powder to deposit more metal in the weld and increase the efficiency of the operation. During welding the electrode melts and the resultant molten metal fuses into the joint. An iron powder coating on a welding electrode deposits more metal than a bare wire electrode and is therefore more efficient. The coating is generally applied by extruding or dipping the electrode into a mixture of

iron powder and a binder. Iron powder is also used in continuous wire electrodes which are cored so that the iron powder is used in conjunction with a flux as a filler.

Cutting and Scarfing

In flame cutting and scarfing, iron powder is introduced into the flame of an oxy-acetylene or oxygen torch. The heat releasing reaction caused by oxidation of the iron raises the temperature of the flame so that it can effectively cut sections of high melting metals and refractories. Analagous methods are also used to cut ladle skulls and lance tap holes in iron and steel making.

THE POWDER METALLURGY PROCESS

Development

Iron powder was probably known as early as the eleventh century, A.D. In the early 1920's, the first powder metallurgy parts were mass produced.

The production of these first non ferrous bushings had led to today's production of a vast variety of P/M parts.

During the past ten years, improved techniques have been developed throughout the industry, contributing to acceptance and growth of the P/M process. Larger and stronger parts are being produced. More complex and critical parts are now being produced from metal powders.

Use of iron powder has doubled over the past 5 or 6 years. With the availability of new powders, and the development of new part fabrication techniques, one can expect continued rapid growth of the PM industry.

The Powder Metallurgy Process

Lubricants, graphite, copper or other metal additives are blended in correct proportion with the iron powder. In the manufacture of a powder metal part, the iron powder is seldom used alone. During the molding step, a lubricant is necessary in order to minimize die wear, aid ejection of the part and promote flow. Lubricants are most generally stearates or waxes employed at a level of about 1% by weight. Usually, other materials are

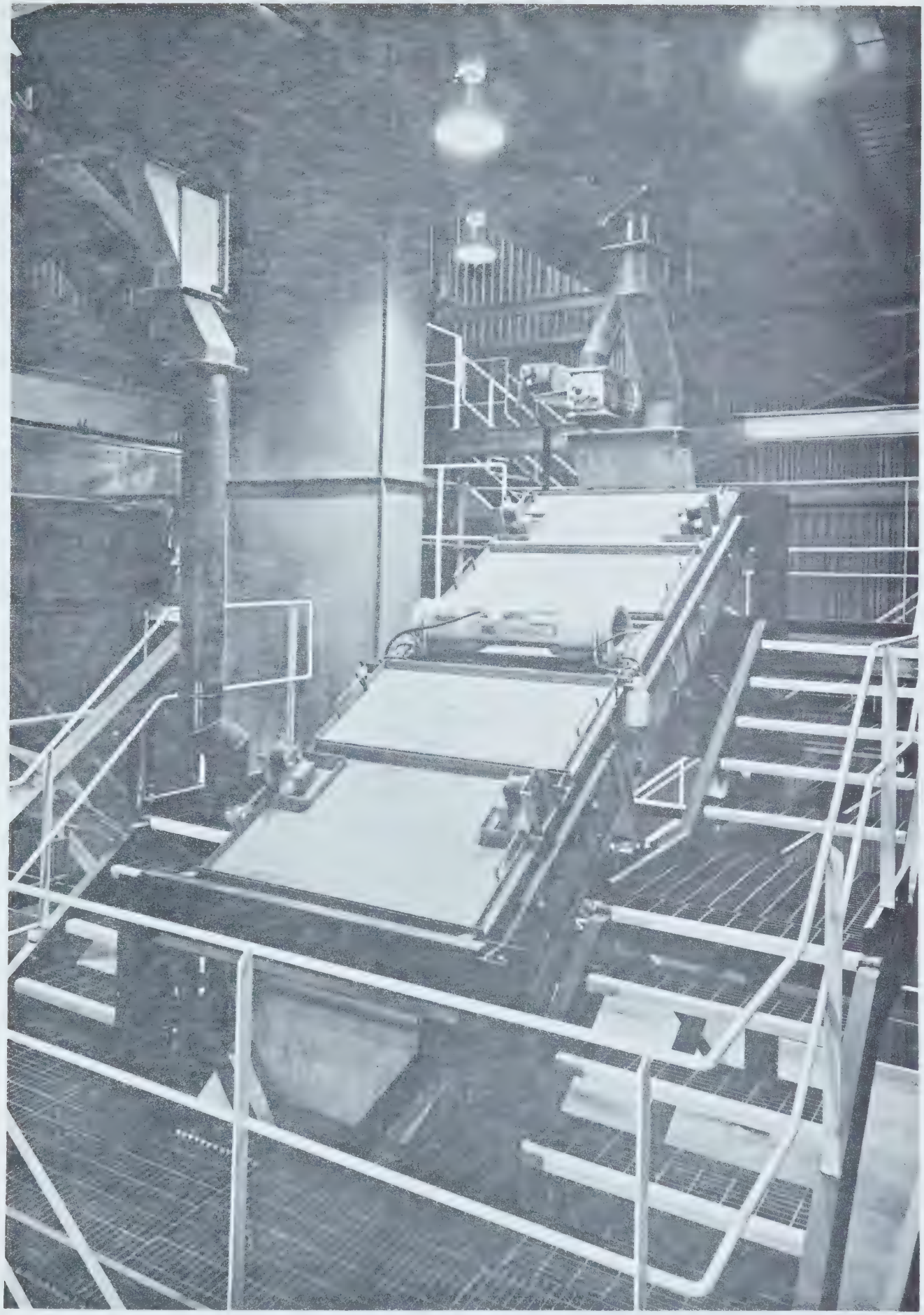
QUEBEC METAL POWDERS LIMITED

Final product blender in the Quebec Metal Powders plant. This equipment is fully automated to insure production of uniform high quality products.

blended with the iron powder to produce desired properties in the final parts such as hardness, wear resistance, ductility and strength. In general, either graphite or copper powders or both are employed. The level of graphite and copper is usually a few percent. Copper contributes to the strength and ductility of the part, while the graphite produces a harder and stronger part.

The iron powder blend is fed into a precision die and compressed by means of a lower and upper punch to the desired shape and size. Dies are usually mounted in a hydraulic press. With the die withdrawn, the die cavity is filled with blended powder from a feeder. Top and bottom punches then simultaneously press the powder into the shape of the die. Compacting pressure may range from 10 to as high as 100 tons per square inch, depending on the material being pressed and the required final properties. The top punch is withdrawn and the compacted part is ejected from the die by the bottom punch. The compacted part is removed from the pressing area and the cycle is repeated for the next part. The as-compacted parts have sufficient strength to allow them to be easily conveyed and handled to the sintering process.

After compacting, the parts are sintered by heating them to a high temperature in a furnace with a controlled protective atmosphere. Sintering bonds the powder particles together across the particles interfaces. The sintering atmosphere generally consists of nitrogen, hydrogen, carbon



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Some of the screening equipment employed in the Quebec Metal Powders plant to insure production of uniform size powders.

monoxide and carbon dioxide in varying ratios, depending upon the application and desired final properties. In the case of parts containing graphite, the atmosphere is carefully controlled to insure the desired final carbon content of the part. Following cooling, the parts are strong and ready for service.

Advantages of the P/M Process

Powder metallurgy is employed to manufacture products which can be made in no other way and those which could be made by another method but for which powder metallurgy is more convenient or more economical.

Savings in labor and materials, elimination of capital investment in machines, reduction in overhead and lead time, greater end product value and better performance are among the important considerations in the decision for powder metallurgy. The powder metallurgy process can be more convenient or more economical, because it does not involve the handling of molten metal, because its end products seldom require subsequent machining or finishing operations, because porosity of products can be controlled over a wide range, and because it permits the rapid mass production of steel in precision dies.

The P/M process is economical because of the mass production techniques employed, the reduction or elimination of scrap losses and the reduction, or in many cases, the complete elimination of machining or finishing operations.

Powder metallurgy is ideally suited to the production of complex and intricate shapes because machining and scrap costs are substantially

less with P/M. Close tolerances and smooth finishes can be consistently maintained, again eliminating the need for machining.

Control of part porosity and density is an important advantage of P/M in parts such as filters, or counter balances. Filters from metal powders can be produced in a variety of shapes and sizes to separate materials from one another.